

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Francesca Pignagnoli, et al.

Serial No. 10/539,961

Art Unit: 1796

Filed: June 17, 2005

Examiner: John M. Cooney

For: POLYOL COMPOSITION AND POLYISOCYANATE-BASED FOAM PREPARED THEREFROM

APPEAL BRIEF

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Appeal Brief is filed in reply to the Office Action mailed October 09, 2007. A Notice of Appeal, a one-month extension of time, and a Request for Oral Hearing accompanied with the required fees have been filed on February 8, 2008.

The fees required under Sections 1.17(a)(1), 41.20(b)(1), and 41.20(b)(3) have already been paid on February 8, 2008. The fees required under Section 41.20(b)(2) are paid on the accompanying Fee Transmittal Sheet herewith. The director is hereby authorized to charge any additional fees to the Deposit Account No. 04-1512.

I. REAL PARTY IN INTEREST

The real party in interest is The Dow Chemical Company, the assignee of record in the instant application.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF THE CLAIMS

Claims 1, 8-15, 19, 20, and 22-25 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow"). Furthermore, Claims 1, 8-15, 19, 20, and 22-25 are the subject of this Appeal.

IV. STATUS OF AMENDMENTS

No Claim was amended after the Final Rejection and prior to this Appeal.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The following is a concise explanation of the subject matter defined in independent Claims 1, 13-14, 19, and 22-23.

According to Claim 1, the instant invention is a polyol composition suitable for preparation of rigid polyisocyanate-based foam. (Specification, Page 3, Lines 1-5). The polyol composition

comprises (a) a blowing agent comprising formic acid (Specification, Page 3, Lines 1-5), wherein the formic acid comprises 1.5 to 3.5 parts per 100 parts by weight of the polyol composition (Specification, Page 5, Lines 1-3); (b) an aromatic polyol comprising an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of phenol with an aldehyde (Specification, Page 3, Lines 1-5), wherein the aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on the total weight of the polyol composition (Specification, Page 4, Lines 25-30); and (c) a physical blowing agent, wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition , and wherein said physical blowing agent being a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, heptane, and isomers thereof (Specification, Page 5, Lines 14-17 and 25-30).

According to Claim 13, the instant invention is a polyurethane foam obtained by bringing together under foam-forming conditions a polyisocyanate with a polyol composition characterized in that:

a) the polyisocyanate is present in an amount to provide for an isocyanate reaction index of from 80 to 150; and

b) the polyol composition comprises (i) formic acid, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts

by weight of said polyol composition including said formic acid;

(ii) an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and

(iii) a physical blowing agent, wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition, and wherein said physical blowing agent being a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, heptane, and isomers thereof. (Specification, Page 3, Lines 13-21; Page 4, Lines 25-30; and Page 5, Lines 1-3, 14-17, and 25-30).

The instant invention according to Claim 14 is a polyisocyanurate foam obtained by bringing together under foam-forming conditions a polyisocyanate with a polyol composition characterized in that:

a) the polyisocyanate is present in an amount to provide for an isocyanate reaction index of from 150 to 600; and

b) the polyol composition comprises (i) formic acid, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid;

(ii) an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde,

wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and (iii) a physical blowing agent, wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition, and wherein said physical blowing agent being a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, heptane, and isomers thereof. (Specification, Page 3, Lines 13-21; Page 4, Lines 25-30; and Page 5, Lines 1-3, 14-17, and 25-30).

The instant invention according to Claim 19 is a process for preparing a closed-celled polyisocyanurate foam by bringing into contact under foam-forming conditions a polyisocyanate with a polyol composition in the presence of a blowing agent mixture wherein the polyol composition comprises an aromatic polyester polyol and an aromatic polyether polyol and wherein the blowing agent mixture comprises formic acid and a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, and heptane, and the isomers thereof, said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid, wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition, and characterized in that the polyisocyanate is present in an amount to provide for an isocyanate reaction index of from greater than 150 to about 600.

(Specification, Page 3, Line 23 to Page 4, Line 2; Page 4, Lines 25-30; and Page 5, Lines 1-3, 14-17, and 25-30).

The instant invention according to Claim 22 is a two component foam forming system comprising:

a) an aromatic polyisocyanate having an average of from 2.8 to 3.2 isocyanate groups per molecule; and

b) a polyol composition that contains: (i) an aromatic polyester polyol and an aromatic polyether polyol based on an initiator obtained from the condensation of a phenol with an aldehyde, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and (ii) a blowing agent mixture comprising formic acid and a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, and heptane, and the isomers thereof, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid, and wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition. (Specification, Page 3, Lines 6-9; Page 4, Lines 25-30; and Page 5, Lines 1-3, 14-17, and 25-30).

The instant invention according to Claim 23 is a method of improving fire retardancy of a polyisocyanate-based foam comprising the steps of:

providing a polyol composition comprising;

a) blowing agent comprising formic acid, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid;

b) an aromatic polyol comprising an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and

c) a physical blowing agent, wherein said physical blowing agent being a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, heptane, and isomers thereof, and wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition;

providing a polyisocyanate;

bringing together under foam-forming conditions said polyol composition and said polyisocyanate; and

thereby forming a polyisocyanate-based foam having an improved fire retardancy. (Specification, Page 3, Lines 10-12; Page 4, Lines 25-30; Page 5, Lines 1-3, 14-17, and 25-30; and Page 17, Lines 8-10).

VI. GROUND'S OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, and 8-12 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow").

Claim 13-15 stands rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow").

Claims 19 and 20 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow").

Claim 22 stands rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow").

Claims 23-25 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow").

VII. ARGUMENT

Claims 1, 8-15, 19, 20, and 22-25, for the reasons explained hereinafter, are not obvious under 35 U.S.C. 103(a); thus, the above-mentioned 103 rejections are improper, and they must be removed.

A. CLAIMS 1, AND 8-12 ARE NON-OBVIOUS UNDER 35 U.S.C. 103(a)

Claims 1, and 8-12 are non-obvious under 35 U.S.C. 103(a) over the U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow") for the reasons stated below.

To reject claims in an application under section 103, an examiner must show a *prima facie* case of obviousness. *In re Deuel*, 51 F. 3d 1552, 1557, 34 U.S.P.Q.2D 1210, 1214 (Fed. Cir. 1995). All words in a claim must be considered in judging the patentability of that claim against prior art. *In re Wilson*, 424 F.2d 1382, 1385, 165 U.S.P.Q. 494, 496 (CCPA 1970). To establish a *prima facie* case of obviousness, the following three basic elements must be met: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) the prior art reference or references when combined must teach or suggest all the claim limitations; **and** (3) there must be a reasonable expectation of success. MPEP § 2143. Finally, if an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending therefrom is non-obvious. *In re Fine*, 837 F. 2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

First, neither Hickey nor Chow, **alone or in combination**, teaches all of the required elements of the instant invention.

The instant invention, as described above, requires the combination of all three elements: a) blowing agent comprising **formic acid**, wherein said formic acid comprising **1.5 to 3.5** parts per 100 parts by weight of said polyol composition including said formic acid; b) **an aromatic polyol comprising an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde**, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and c) a physical blowing agent, wherein the physical blowing agent comprises 4 to 10 parts per 100 parts by weight of the polyol composition, and wherein said physical blowing agent being a **hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, heptane, and isomers thereof**. This **required combination** of the above-mentioned three elements in the specific amounts is important to instant invention because it facilitates the unexpected improved properties i.e. as fire and smoke retardation.

With regard to the U.S. Patent No. 6,359,022 ("Hickey"), Hickey discloses a resin blend including: (a) **an aromatic polyester polyol reaction product** formed by inter-esterification of a phthalic acid based material; a hydroxylated material having a functionality of at least 2; and a hydrophobic material; and (b) **a C₄-C₈ hydrocarbon blowing agent**. (Abstract). According to Hickey,

the polyol component may also include a polyether polyol, and a preferred polyether polyol is polyoxyalkylene polyether polyol. (Column 11, Lines 65-67). However, Hickey fails to require **at least 20 percent by weight percent of an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde, based on total weight of the polyol composition,** as required by the instant invention. Furthermore, Hickey discloses that organic carboxylic acids may be used as auxiliary chemically active blowing agents, and a most preferred carboxylic acid is formic acid. (Column 14, Lines 5-7 and 44-45). However, not only does Hickey fail to require formic acid, but it also fails to mention any thing about the required amount thereof, **i.e. formic acid comprises 1.5 to 3.5 parts per 100 parts by weight of the polyol composition including said formic acid.** Additionally, not only does Hickey fail to require hydrocarbons as the physical blowing agent, but it also fails to mention any thing about the required amount thereof, i.e. the physical blowing agent comprises 4 to 10 parts per 100 parts by weight of the polyol composition.

With regard to the U.S. Patent No. 3,842,036 ("Chow"), Chow discloses polyurethane-isocyanurates produced from an alkylene oxide condensate of a Novolak resin, an organic polyisocyanate, and a catalyst that promotes the formation of isocyanurates from isocyanates. (Column 1, Lines 15-19). However, chow fails to mention anything about formic acid or the required amounts thereof.

Although Hickey briefly mentions formic acid as a possible auxiliary blowing agent, Hickey fails to recognize the significance of the presence of the formic acid in an amount in the range of 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid; therefore, Hickey fails to require the combination of these three elements, i.e. a, b, and c. In addition, Chow fails to even mention anything about formic acid.

Therefore, the teachings of Hickey or Chow, **alone or in combination**, fail to teach all of the required elements of the instant invention.

Second, there is no suggestion or motivation, either in the cited references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the teachings of either Hickey and/or Chow to require the combination of the above-mentioned three elements.

There is no such suggestion or motivation in either Hickey or Chow because not only do both of these references fail to require the combination of the above-mentioned three elements, but both of these cited references also teach away from the instant invention via their express teachings. Chow teaches away from the instant invention because Chow teaches that blowing agents include halogenated-substituted aliphatic hydrocarbons, water, low boiling hydrocarbons, gases and compounds easily volatilized by the exotherm of the isocyanate-reactive hydrogen reaction, and thermally

unstable compounds. (Column 6, Lines 37-50). Additionally, Hickey teaches away from the instant invention by requiring an aliphatic or cycloaliphatic C₄-C₇ hydrocarbon blowing agent, and further by only requiring an aromatic polyester polyol reaction product.

Additionally, Examiner's conclusive statements, i.e. such knowledge are within the purview of the ordinary practitioner in the art, (Office Action date October 09, 2007, Page 2, Lines 3-14), does not provide the required showing. Examiner fails to point out to any facts to support his assertion, i.e. a person skill in the art is in the possession of the control amounts of the blowing agent (formic acid) as required by the instant invention. (Office Action date October 09, 2007, Page 2, Lines 3-14).

Therefore, there is no suggestion or motivation, either in the cited references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the teachings of either Hickey or Chow to require the combination of the above-mentioned three elements.

Therefore, the Examiner has failed to establish all of the required elements of a *prima facie* case of obviousness.

Finally, assuming, *arguendo*, that the Examiner has shown a *prima facie* case of obviousness, the unexpected results of the instant invention negates any such obviousness. Assuming *arguendo* that a *prima facie* case of obviousness has been established, the applicant can overcome the *prima facie* case of obviousness by

showing unexpected results, i.e. improved fire retardation and smoke properties. "When an Applicant demonstrates substantially improved results, and states that the results are unexpected, this should suffice to establish unexpected results in the absence of evidence to the contrary." *In re Soni*, 54 F. 3d 746, 34 U.S.P.Q. 2D 1684 (Fed. Cir. 1995).

To require the above-mentioned three elements a, b, and c in the required specific amounts is important because this combination facilitates the production of polyisocyanate-based foams with unexpected improvements in general physical performance including flame retardancy and smoke retardation. (Specification, Page 2, Lines 29-32). According to the instant Specification, foams prepared in the presence of formic acid **exhibit notably stronger flame retardant and smoke suppressant characteristics than those foams prepared in the absence of the acid.** (Specification, Page 13, Line 19-20). The unexpected results of the instant invention is further shown in Table 1; for example, Foam 3 (an Example of the Instant Invention) and Foam 4* (a Comparative Example) show major differences in following areas, as shown in Table A:

Table A

	Foam 3	Foam 4*
DIN 4102 B2 rating (cm)	6.5	9.2
Smoke Development (NBS)	66	86

% Skin Cure (45-50C mold temp)	100% at 5 minutes	25% at 5 minutes
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Such results were unexpected, and the Applicant clearly states them as such in his Affidavit including Appendix A, dated March 2, 2007, copy attached herewith; thus, assuming, *arguendo*, that the Examiner has shown a *prima facie* case of obviousness, such unexpected results negates any such obviousness.

However, the Examiner has taken the position that the Applicant must show by **CLEAR AND CONVINCING SHOWING** of new or unexpected results associated with the combinations of their claims that are commensurate in scope with the scope of the claims as they currently stand. (Office Action Dated October 9, 2007, Page 6, Lines 29-32). Examiner is in error for the following reasons. First, clear and convincing showing is not the standard for showing of unexpected results. According to *In re Soni*, "When an Applicant demonstrates substantially improved results, and states that the results are unexpected, this should suffice to establish unexpected results in the absence of evidence to the contrary." *In re Soni*, 54 F. 3d 746, 34 U.S.P.Q. 2D 1684 (Fed. Cir. 1995). The test under *In re Soni* does not require a clear and convincing showing; instead, it requires a rebuttable showing. The Applicant is unaware of any such required clear and convincing showing, and the Examiner has failed to point out to any law that provides support for his higher standard of clear and convincing showing. In this

case, the Applicant has clearly demonstrated substantial improvements via experimentation and data; furthermore, the Applicant has stated these results are unexpected, e.g. declaration. Furthermore, the Examiner has failed to rebut the unexpected results of the instant invention via contrary evidence. The Examiner, however, as explained above, erroneously required the Applicant to show by **CLEAR AND CONVINCING SHOWING** new or unexpected results associated with the combinations of their claims that are commensurate in scope with the scope of the claims as they currently stand. (Office Action Dated October 9, 2007, Page 6, Lines 29-32). This is beyond the scope of authority delegated to the Examiner. Therefore, the applicant has shown unexpected results. The Examiner further cites *In re Greenfield* (Office Action Date October 9, 2007, Page 5, Lines 20-25) to support his argument, i.e. unexpected results associated with the combinations of their claims that are commensurate in scope with the scope of the claims as they currently stand. (Office Action Dated October 9, 2007, Page 6, Lines 29-32). However, a careful reading of the *In re Greenfield* reveals that this case does not seem to provide support for Examiner's position. In *In re Greenfield*, "the specification disclosed test results of the stabilizing effects of **only one 3-isothiazolone** (and had generalized conclusions regarding a few other species) of a claimed subgenus which consisted of several hundred compounds." *In re Greenfield and Dupont*, 571 F.2d 185, 197 U.S.P.Q. 227 (CCPA 1978). Therefore, the court properly held that "establishing only one (or small number of) species gives

unexpected results is inadequate proof, for it is the view of this court that objective evidence of non-obviousness must be commensurate in scope with the claims which the evidence is offered to support." *In re Greenfield and Dupont*, 571 F.2d 185, 197 U.S.P.Q. 227 (CCPA 1978). However, the instant Application is different; the Applicant has already shown that the presence of formic acid in the amount of 1.5 to 3.5 per 100 parts by weight of the polyol composition including the formic acid provides unexpected results. In fact, the Examiner acknowledges the showing of unexpected results for a formic acid content of 1.5 to 2 to commensurate in scope with the claims if they were to be limited to 1.5 to 2 parts of formic acid. However, unlike *In re Greenfield*, the claimed range of formic acid is limited, i.e. 1.5 to 3.5 parts of formic acid, and supported with actual experimentations. Therefore, the evidence of non-obviousness commensurate in scope with the claims as they currently stand.

Accordingly, the instant invention, as described in Claim 1, is non-obvious over the U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow").

Finally, if an independent claim is non-obvious under 35 U.S.C. 103, then any claim depending therefrom is non-obvious. *In re Fine*, 837 F. 2d 1071 (Fed. Cir. 1988). Claims 8-12 depend from Claim 1; thus, Claims 8-12 are non-obvious.

Accordingly, the above-mentioned rejections should be removed.

B. CLAIMS 13-15 ARE NON-OBVIOUS UNDER 35 U.S.C. 103(a)

Furthermore, the instant invention, as described in Claims 13-15 are non-obvious under 35 U.S.C. 103(a) over the U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow") non-obvious for the reasons stated above with regard to the instant invention, as described in Claim 1.

C. CLAIMS 19-20 ARE NON-OBVIOUS UNDER 35 U.S.C. 103(a)

Furthermore, the instant invention, as described in Claims 19-20 are non-obvious under 35 U.S.C. 103(a) over the U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow") non-obvious for the reasons stated above with regard to the instant invention, as described in Claim 1.

D. CLAIM 22 IS NON-OBVIOUS UNDER 35 U.S.C. 103(a)

Furthermore, the instant invention, as described in Claim 22 is non-obvious under 35 U.S.C. 103(a) over the U.S. Patent No. 6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow") non-obvious for the reasons stated above with regard to the instant invention, as described in Claim 1.

E. CLAIMS 23-25 ARE NON-OBVIOUS UNDER 35 U.S.C. 103(a)

Furthermore, the instant invention, as described in Claims 23-25 are non-obvious under 35 U.S.C. 103(a) over the U.S. Patent No.

6,359,022 ("Hickey") in view of the U.S. Patent No. 3,842,036 ("Chow") non-obvious for the reasons stated above with regard to the instant invention, as described in Claim 1.

F. CONCLUSION

In view of the foregoing, Applicant respectfully requests an early Notice of Allowance in this application.

Respectfully submitted,

/Ray Ashburg/
Registration No. 53,956

Dated: April 8, 2008

Claims Appendix

1. A polyol composition suitable for the preparation of a rigid polyisocyanate-based foam comprising:

a) blowing agent comprising formic acid, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid;

b) an aromatic polyol comprising an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and

c) a physical blowing agent, wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition , and wherein said physical blowing agent being a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, heptane, and isomers thereof.

2) (Cancelled).

3) (Cancelled).

4) (Cancelled).

5) (Cancelled)

6) (Cancelled)

7) (Cancelled)

8) The polyol composition of Claim 1, wherein said polyol composition further comprising an aromatic polyester polyol.

9) A multi component system suitable for the preparation of rigid polyisocyanate-based foam comprising:

a first component, said first component being an aromatic polyisocyanate; and

a second component, said second component being a polyol composition as claimed in Claim 1.

10) A process for preparing a polyisocyanate-based foam which comprises bringing together under foam-forming conditions a polyisocyanate with a polyol composition as claimed in Claim 1.

11) The process of Claim 10, wherein the polyisocyanate is present in an amount to provide for an isocyanate reaction index of from about 80 to about 150.

12) The process of Claim 10, wherein the polyisocyanate is present in an amount to provide for an isocyanate reaction index of from about 150 to about 600.

13) A polyurethane foam obtained by bringing together under foam-forming conditions a polyisocyanate with a polyol composition characterized in that:

a) the polyisocyanate is present in an amount to provide for an isocyanate reaction index of from 80 to 150; and

b) the polyol composition comprises (i) formic acid, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid; (ii) an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and (iii) a physical blowing agent, wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition, and wherein said physical blowing agent being a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, heptane, and isomers thereof.

14) A polyisocyanurate foam obtained by bringing together under foam-forming conditions a polyisocyanate with a polyol composition characterized in that:

a) the polyisocyanate is present in an amount to provide for an isocyanate reaction index of from 150 to 600; and

b) the polyol composition comprises (i) formic acid, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid; (ii) an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and (iii) a physical blowing agent, wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition, and wherein said physical blowing agent being a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, heptane, and isomers thereof.

15) A laminate comprising the polyurethane foam of Claim 13 or Claim 14.

16) (Cancelled).

17) (Cancelled).

18) (Cancelled).

19) A process for preparing a closed-celled polyisocyanurate foam by bringing into contact under foam-forming conditions a polyisocyanate with a polyol composition in the presence of a blowing agent mixture wherein the polyol composition comprises an aromatic polyester polyol and an aromatic polyether polyol and wherein the blowing agent mixture comprises formic acid and a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, and heptane, and the isomers thereof, said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid, wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition, and characterized in that the polyisocyanate is present in an amount to provide for an isocyanate reaction index of from greater than 150 to about 600.

20) The process of Claim 19, wherein the polyisocyanate is an aromatic polyisocyanate having on average from 2.8 to 3.2 isocyanate groups per molecule.

21) (Cancelled).

22) A two component foam forming system comprising:
a) An aromatic polyisocyanate having an average of from 2.8 to 3.2 isocyanate groups per molecule; and

b) A polyol composition that contains: (i) an aromatic polyester polyol and an aromatic polyether polyol

based on an initiator obtained from the condensation of a phenol with an aldehyde, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and (ii) a blowing agent mixture comprising formic acid and a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane, hexane, cyclohexane, and heptane, and the isomers thereof, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid, and wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition.

23) A method of improving fire retardancy of a polyisocyanate-based foam comprising the steps of:

providing a polyol composition comprising;

a) blowing agent comprising formic acid, wherein said formic acid comprising 1.5 to 3.5 parts per 100 parts by weight of said polyol composition including said formic acid;

b) an aromatic polyol comprising an aromatic polyoxyalkylene polyol based on an initiator obtained from the condensation of a phenol with an aldehyde, wherein said aromatic polyoxyalkylene polyol comprising at least 20 weight percent based on total weight of the polyol composition; and

c) a physical blowing agent, wherein said physical blowing agent being a hydrocarbon selected from the group consisting of butane, pentane, cyclopentane,

hexane, cyclohexane, heptane, and isomers thereof, and wherein said physical blowing agent comprising 4 to 10 parts per 100 parts by weight of said polyol composition;

providing a polyisocyanate;

bringing together under foam-forming conditions said polyol composition and said polyisocyanate; and

thereby forming a polyisocyanate-based foam having an improved fire retardancy.

24) The method of improving fire retardancy of a polyisocyanate-based foam according to Claim 23, wherein said polyisocyanate is an aromatic polyisocyanate having on average from 2.8 to 3.2 isocyanate groups per molecule.

25) The method of improving fire retardancy of a polyisocyanate-based foam according to Claim 23, wherein said foam being a laminate.

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IX. Evidence Appendix

- (1.) Declaration of Paolo Golini under § 1.132
- (2.) Appendix A

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Filed: June 17, 2005 Examiner: John M. Cooney
For: POLYOL COMPOSITION AND POLYISOCYANATE-BASED FOAM PREPARED THEREFROM

X. Related Proceedings Appendix

No Related Proceedings

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Francesca Pignagnoli

Serial No. 10/539,961

Art Unit: 1711

Filed: June 17, 2005

Examiner: John M. Cooney

For: POLYOL COMPOSITION AND POLYCYANATE-BASED FOAM PREPARED
THEREFROM

DECLARATION OF PAOLO GOLINI UNDER § 1.132

I, Paolo Golini, residing at Via Martiri di Cervarolo, nr 11, Reggio Emilia, Italy 42100, under the penalty of perjury, hereby declare the following:

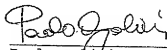
1. I hold a Chemistry and Pharmaceutical Technology Degree from Milan University, Milan, Italy, awarded in 1985.
2. For the past 19 years, I have been working as a chemical research and development engineer for The Dow Chemical Company (2002-Present); and EniChem (1987-2001).
3. For at least 13 years, I have been working extensively in the field of chemical engineering with a concentration in rigid polyurethane foams (1994-present).
4. I am also one of the lead inventors listed in the U.S. Patent Application No. 10/539,961.
5. I have reviewed the following U.S. Patent Nos. 6,359,022; and 3,842,036, which were cited against the Application No. 10/539,961.
6. I have also reviewed the Office Action in response to the Application No. 10/539,961, dated September 11, 2006.
7. Additional comparative foam Nos. 3A, 3B, and 3C were prepared according to the formulations shown in Table I,

attached hereto as Appendix A, and tested for their fire retardancy properties, i.e. DIN 4102 B2 rating (cm), and smoke development (NBS). The results are also shown in Table I, attached hereto as Appendix A.

8. A comparison of the inventive foam No. 3 and comparative foam Nos. 4, 3A, 3B, and 3C clearly reveals that the inventive foam No. 3 possess unexpected improved fire retardancy properties, i.e. DIN 4102 B2 rating (cm), and smoke development (NBS), vis-à-vis comparative foam Nos. 4, 3A, 3B, and 3C. Such improved fire retardancy properties are unexpected because a person of ordinary skill in the art would not expect such improvements by using a blowing agent, i.e. formic acid.
9. I hereby declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both under 18 U.S.C 1001 and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This is the 2nd day of March, 2007..

Respectfully yours,


Paolo Golini

Appendix A

Pbw	Foam 1	Foam 2*	Foam 3	Foam 3A	Foam 3B	Foam 3C	Foam 4*	Foam 5	Foam 6	Foam 7*	Foam 8	Foam 9*
Polyol A	30.1	30	31	31	6	31	31	52.3	45.4	51	24.8	
Polyol B	25	25	30.5	30.5	30.5	30.5	30.5	/	/	/	24.7	47.6 (*)
Polyol C	11.5	11.5	/	/	/	/	/	/	/	/		
Polyol D	/	/	9.1	9.1	9.1	9.1	9.1	/	/	/		
Voranol CP1055 (Polyol E)					25							
DEEP	11.5	11.4	9.8	9.8	9.8	9.8	9.8	8	12.9	11	8	12.89
TCPP	14	14	9.8	9.8	9.8	9.8	9.8	30	31.7	31.9	30	30.25
MEG	/	/	0.5	0.5	0.5	0.5	0.5	/	/	/		
L6900	/	/	/	/	/	/	/	/	1.98	1.5		
DABCO DC5598	1.8	1.8	2.95	2.95	2.95	2.95	2.95	3	/	/	3	3
DMCHA	0.47	0.4						0.2	/	/	0.05	
DMEE	/	/	/	/	/	/	/	/	0.2	/		
Toyocat DM70	0.2											
PMDETA	/	0.07	0.1	0.1	0.1	0.1	0.1	/	/	/		
CURITHANE S2	/	/	4.92	4.92	4.92	4.92	4.92	/	3.03	/		
Dabco K15	0.33											
CURITHANE 206	1.74	2.2	/	/	/	/	/	1.5	/	0.7	1.45	1.5
DABCO TMR	/	/	1.0	1.0	1.0	1.0	1.0	/	/	/		
Water	1.91	3.15	/	0.8	/	/	1.2	/	1.98	3.12		1.98
Formic Acid	1.45	/	1.6	0.4	1.6	8.1	/	4.99	2.78	/	4	2.78
HFC 245fa											4	
n-Pentane	/	/	9	9	9	9	9	/	/	/		
ISO A (Index)	188.5 (300)	231 (300)	180 (340)	195 (340)	174 (340)	300 (340)	180 (320)	/	/			
ISO B	/	/	/				/	160 (293)	168 (240)	180 (247)	143 (290)	179 (240)
Polyol blend stability	Clear ,stable	Clear ,stable	/	/	/	/		Clear ,stable	Clear ,stable	Clear ,stable	Clear ,stable	
Reactivity CT/GT (secs)	5/42	5/26	6/41	7/44	7/45	8/82		6/95	12/ 100	13/88	6/83	20/105
Free-Rise Core density (kg/m ³)	44.9	43.3	38.9	37.8	38.1	31		34	31	35	32.4	35
DIN 4102 B2 rating (cm)	5	/	6.5	8	8.5	15	9.2	6	9	12.5	6.4	7.8
Butler Chimney test												
Flame spread	15.9 cm	20 cm	/									
Weight retention	92.6 %	91.5	89.8	n.d.	n.d.	n.d.	87					
Smoke development (NBS)	137	176	66	85	94	149	86					

% skin cure (45-50C mold temp)	>70% at 7min	25 % at 7 min	100% at 5 min	50% at 7 min	90% at 7 min	20% at 7 min	25% at 5 min	100% 12 min	100% 12 min	70% (soft foam) 12'	100% 12 min	50% (soft foam) 12'
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Polyol E A propanetriol initiated oxypropylene polyol, VORANOL CP1055,
available from The Dow Chemical Company. Hydroxyl Number: 165.